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### PROJECT PYRALP

#### TECTONICS RELATIONSHIPS BETWEEN PYRENEES AND ALPS (SOUTHERN FRANCE)

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PROGRESS REPORT  
for period February - March 1974

Report date: April 1974

#### Sponsoring Agency:

CENTRE NATIONAL D'ETUDES SPATIALES  
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### Introduction

This present report concerns February and March 1974 during which interpretation of data obtained from SL 3 started.

The data processing begun in January continued in February and March. It needed more time than originally expected.

Geological investigations are in progress. They will be continued in the coming months. Some new facts have been pointed out, and significant results are expected for the next report at the end of June 1974.

There are no authorssignificant results in this report.

### Data reception

Last data expected from SL 3 have been delivered on February 1st. They are photographic products of S 190 B.

EREP pass n° 32 - 3 frames - color 86 209 to 86 211  
n° 35 - 29 " " 86 245 to 86 273  
n° 52 - 20 " I. R. - Color 87 333 to 87 352

### Localisation and short comments on the photos

#### - Pass 32

86 209 - Central Alps of Switzerland and Italy. Upper Rhone valley, and lakes of northern Italy - glaciers and snowy areas (cloud cover 20%)

86 210 - Central Alps, Switzerland, Italy and Austria. Dolomite massive - good example of alpine geomorphology (c.c. 30 %)

86 211 - Some area (c.c. 70 %)

#### - Pass 35

86 245 to 247 - Spain (cloud cover 90%)

86 248 - 249 - Spain - Valley of Ebro river near its mouth (c.c. 80 %)

86 250 to 253 - Spain, Mediterranean coast of Spain near Barcelona, Costa Brava (c.c. 40% to 75 %)

86 254 - Northeastern Spain and southern France - Eastern Pyrenees ending in the Mediterranean sea (Cap Creus) (c.c. 20 %)

86 255 - Some area with a large part of sea

86 256 - 257 - Gulf of Lion - Mainly sea with sea with only a small part of the coast of Languedoc (France)

86 258 - 259 - Southern France - Mediterranean coast, mouth of the Grand Rhone, Marseille, Toulon - New industrial area of Pos (c.c. < 5 %)

86 260 - 261 - Southern France - Marseille, Toulon, Nice, Cristalline Provence (Maures and Esterel massives) - Mouth of the Var river close to Nice. In the northern part the Durance river valley and the intensively folded area of Southern Alps (Castellane area) - (c.c. 5 %)

86 262 - 263 - Southern France and Northwestern Italy - "Cote d'Azur" from St Raphaël to Nice and Monaco. Clouds over the Po basin entering in the deep valleys of the Argentera mountains (c.c. 10 and 60%)

86 264 - Northern Italy - Haze in the coastal part and important cloud cover in the Po valley north of Appenine chain (c.c. 80%)

86 265 to 267 - Northern Italy - Gulf of Genova-Appenine mountain chain (c.c. 40 and 60%)

86 268 to 271 - Northern Italy. Plain of Po river, south of Milan (c.c. 20 %)

86 272 - Plain of Venezia - Northern Italy, Adriatic sea - (c.c. 20%)

86 273 - Northeastern Italy and northwestern Yugoslavia border (North of Trieste) - (c.c. 20%)

- Pass 52 - I.R. color, partly stereo

87 333 - 336 - Southwestern France, Aquitanian Basin - (c.c. 70% to 80%)

87 337 - 339 - Southern France - Montagne noire, Languedoc, West of the Rhone Delta. Area of Beziers and Sete. Gulf of Lion (c.c. 60% to 30%)

87 340 - 341 - Mainly over the sea, Gulf of Lion, small part of the Languedoc coast.

87 342 to 348 - Clouds over the sea.

87 349 - 350 - Northwestern Sardinia.

87 351 - 352 - Northwestern Sicily, area of Palermo and Trapani

## S 192 Data - Pl 1

After an attentive review of the screening film, three parts of S 192 data were selected, and the corresponding digital tape was ordered by a letter dated March 7th. All thirteen channels are needed, if possible in 7 tracks, 800 B.P.I.

### - Pass 32 - (73 - 9 - 11)

1) - Start 13 h 15' 18"    | Duration 12"  
- End    13 h 15' 30"    |

2) - Start 13 h 16' 02"    | Duration 31"  
- End    13 h 16' 33"    |

### - Pass 35 - (73 - 9 - 12)

3) - Start 12 h 32' 31"    | Duration 13"  
- End    12 h 32' 44"    |

Total duration ..... 56"

### Part 1

The first part selected from pass 32 gives imagery of the Northern slope of the Pyrenees range.

A whole section of the range is represented, from the crystalline and metamorphic rocks of the mountain axis to the Tertiary and recent sediments of the Southern Aquitanian Basin north of the north Pyrenean thrust.

The oil and gas fields of Lacq and Meillan are located here. A lot of surface and subsurface geological data (drilling and geophysical prospecting) is available from national pétrolium companies.

One of the most extensive lineaments pointed out by investigations using ERTS 1 imagery crosses the Pyrenees in this area. Understanding its significance should be very important for interpreting Pyrenean tectonics.

In this area there is a major climatic boundary. The southern Pyrenees, in Spain are warm, sunny and arid while the northern Pyrenees in France are wet and generally more cloudy (the weather was exceptionally fine on September 9 1973). This difference attested to by forest development is obvious on R.I. color photographs (S 190 A n° 319 pass 32).

Multispectral S 192 should be useful for analysing relationships of geology and vegetation development in different climatic environments.

### Part 2

The second part selected from the S 192 record of pass 32 represents a section of the Massif Central uplift from the northeastern Aquitanian Basin to the Rhone Valley south of Lyons.

Numerous different geological formations are found in this area, i.e. crystalline metamorphosed rocks of Paleozoic age. Sedimentary rocks of Paleozoic and Cenozoic ages - recent volcanic rocks - large tectonic features like the Cevennes fault system, which plays an important part in the relation between the Alps and the Pyrenees, can be studied here.

Immediately west and south of the area covered by the selected S 192 data are two localities where ground data were collected last summer.

Different climatic zones are also present here. An Atlantic oceanic climate is found on the Southwestern slope of Massif Central while a Mediterranean climate already influenced by the nearly Alpine reliefs is found in the Rhone Valley. They are separated by a relatively high mountain range (more than 1 500 m elevation) that is wet and cold.

A good test of the efficiency of MSS S 192 for differentiating and delineating geological formation is also expected in this area.

### Part 3

The third part selected is from pass 35. It crosses the Mediterranean coast near Marseilles. There are the mouth of the Grand Rhone and the eastern branch of the Rhone delta where sedimentological studies were conducted in 1973 and will be continued next summer. Much information is expected from S 192 data for a general synthetic survey to be presented at the 9th International Sedimentological Congress in 1975 in Nice, France.

In the same area are the large industrial zone of Etang de Berre and the new development of Fos (large industrial harbour). A methodology for detecting marine and land pollution can be developed.

#### Investigations during the reported period (Pl 2)

None of them has been completed.

- 1) Investigations using S 190 A data (color and black and white).  
(enlargement to 1:1,000,000 th and 1:500,000 th scale)

1.1) - Pass 32, frame number 319.320.321

The area covered by these frames lies between the Pyrenees range and the southwestern part of the Massif Central uplift. It represents a large part of the eastern Aquitane Basin. The city of Toulouse on the Garonne River is near the center of the region (n° 320). Photos from rolls 35 and 36 (0.4 - 0.5 and 0.5 - 0.6  $\mu$ m) as photos from rolls 34 and 33 (color and color I.R.) are of great interest from a geological point of view.

Unknown as not fully understood facts have been observed. Important results renewing interpretation of structural features known mainly from old geophysical data are expected.

Some further investigations and checks are still needed, such as a comparison of observations with normal air photos on a 1: 50,000th scale, and compiling detailed geological and geophysical maps. The making of composite color imagery is in progress.

#### I.2) - Pass 32, frame n° 32I

A geological investigation studying the permian trough at St Affrique is nearly completed using different data from Skylab, ERTS 1 imagery and normal aerial photographs.

A central graben where the Upper Permian has been preserved has been pointed out. It was still unknown because hardly seen on aerial photos on a large scale and because the Upper and Lower Permian are not easily to spot in the field. It is quite clear on SL 3 photos rolls 35, 36, 33 and 34.

#### 2) Investigations using S 190 B data

Photos n° 86 259 and 86 260, enlarged to a 1:250,000th scale. These two photos show an area north of Marseilles and Toulon on the Mediterranean coast. This area is included within the boundaries of the new 1:250,000th geological map now being prepared to be printed soon by the Service Geologique National (B. R. G. M.). An attempt to correct and improve the drawing of geological contours has been undertaken.

In this intensively folded and faulted area where numerous geological studies have been completed and published, S 190 B of SL 3 imagery gives a better synthetic view of the most important features for use in compiling a 1:250,000th map.

Geological contouring has already been modified in many points. These modifications will later be proposed to the authors of the map and their validity will be discussed.

#### Planning for the next months

- 1) To continue enlarging and printing photographic products from S 190 A and S 190 B.  
Diffusion of photographic data to the investigators.
- 2) Conventional photointerpretation at different scale using different S 190 A data products  
To continue investigation started in February and March 1974 until completed.
- 3) Comparing with field data and ERTS 1 data.
- 4) Composite color processing - Optical filtering
- 5) As soon as digital tape S 192 will be delivered, processing of this data.

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Areas selected for S. 192 data.

Pl. 1

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Areas selected for S. 192 data.

Pl. 1

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Pass 32

Pass 35

Pass 35

G.T.

2

3

1

